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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/600,039	06/20/2003	Oliver Chyan	122302.00001 (UNTD-0001)	6398
25555	7590	11/17/2006	EXAMINER	
JACKSON WALKER LLP 901 MAIN STREET SUITE 6000 DALLAS, TX 75202-3797			LE, DUNG ANH	
			ART UNIT	PAPER NUMBER
			2818	

DATE MAILED: 11/17/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/600,039

Applicant(s)

CHYAN ET AL.

Examiner

DUNG A. LE

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 24 August 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1, 3-10, 25-29, 33, 34 and 48 is/are pending in the application.
- 4a) Of the above claim(s) 47 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1 and 7-10 is/are allowed.
- 6) ☒ Claim(s) 25-29, 33, 34 and 48 is/are rejected.
- 7) ☒ Claim(s) 3-6 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____

- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

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DETAILED ACTION

Claims 1, 25 and 48 are amended. Claim 47 is withdrawn. Claims 2,11-24,30-32 and 35-36 are canceled. Claims 1,3-10,25-29,33-34 and 48 are pending.

Claim Objections

Claims ~~2~~3-6 are objected to because of the following informality:

Claims ~~2~~3-6 depend from canceled claim 2.

Reasons for Indication of Allowable Subject Matter

Claims 1, 3-10 are allowed.

If Applicants are aware of better art than that which has been cited, they are required to call such to attention of the examiner.

Claim Rejections

Set of claims 25-29.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 25 and 28-29 are rejected under 35 USC 102 (b) as being anticipated by Choi (5637533).

Choi teach a method of controlling and containing copper diffusion during the integration of copper interconnects during the fabrication of integrated circuits (especially refer to Fig. 1F refer to related texts), comprising:

preparing an inter-level dielectric substrate 5;

depositing one or a plurality of layers of RuO₂ 10 directly on the inter-level dielectric substrate 5; and

depositing copper 11 on the RuO₂ layer.

Regarding claim 28, further comprising depositing the RuO₂ layer on the inter-level dielectric using a thermal oxidation technique (col. 2 and lines 40-50) .

Regarding claim 29, further comprising depositing the RuO₂ layer on the inter-level dielectric using a physical vapor technique (col. 1 and lines 15-20).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 26- 27 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Choi in view of the following remark.

Choi discloses the claimed invention as applied to claim 25 including the step of depositing the RuO₂ layer on the inter-level dielectric using a thermal oxidation technique (col 2, lines 40-45) and depositing the RuO₂ layer on the inter-level dielectric using a physical vapor technique (col 1, line 17) except for depositing the RuO₂ layer on the inter-level dielectric using an atomic layer technique and depositing the RuO layer on the inter-level dielectric using an electrochemical technique.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to depositing the RuO₂ layer on the inter-level dielectric using an atomic layer technique and depositing the RuO layer on the inter-level dielectric using an electrochemical technique to form RuO₂, because the above-mentioned methods are commonly used to prevent undesirable or detrimental reactions in the contact region, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the desired application.

Set of claims 33-34

Applicants argued that Claims 33 - 34 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Iwasaki. The Examiner asserts that Iwasaki discloses the use of Ru and RuO₂ as a diffusion barrier. Applicant respectfully asserts that Iwasaki discloses the use of a barrier metal composite to prevent diffusion and does not disclose the use of Ru and RuO₂ alone, or without an added element. Thus, claims 33 - 34, which pertain to the use of Ru and RuO₂ alone, rather than a composite metal layer, as a diffusion barrier, are not anticipated by Iwasaki.

But Claims 33-34 are rejected under 35 USC 102 (e) as being anticipated by Iwasaki et al. (6,624,513). Iwasaki et al. teaches a method of controlling copper diffusion during the integration of copper interconnects during integrated circuit fabrication, comprising using Ru (col 12, lines 20-31) and RuO₂ as a diffusion barrier, Iwasaki discloses the use of a barrier metal composite to prevent diffusion and does not disclose the use of Ru and RuO₂ alone (col 12, lines 54-56).

Regarding claim 34, further comprising eliminating a copper seed layer (fig. 13).

Independent claim 48

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claim 48 is rejected under 35 USC 102 (b) as being anticipated by Choi (5637533).

Choi teaches a method of controlling and containing copper diffusion during the integration of copper interconnects during the fabrication of integrated circuits, comprising:

preparing an inter-level dielectric substrate 5;
depositing one or a plurality of layers 10 of RuO₂ or Ru or a combination thereof~ without additional elements, on the inter-level dielectric substrate 5; and
depositing copper 11 on the layer of RuO₂ or Ru or a combination thereof, wherein the method eliminates the need for a copper seed layer (especially see fig. 1F refer to related texts).

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not

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mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Conclusion.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dung A. Le whose telephone number is (571) 272-1784. The examiner can normally be reached on Monday-Tuesday and Thursday 6:00am- 4:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, M. Smith can be reached on (571) 272-1907. The central fax phone numbers for the organization where this application or proceeding is assigned are (571)272-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

DUNG A. LE
Primary Examiner
Art Unit 2818

